AR REPORT – 1st SEMESTRE 2020/2021

Group 2

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ADDRESSING

First, we had to do the addressing of the networks, so we can assign IPs to the interface of all devices in the topology.

The connections between autonomous systems (ASes) are within the block 7.7.2.0/24 with a mask of /29. They are the following:

1. 7.7.2.0/29 - 7.7.2.7/29 (SwR9 – R8)
2. 7.7.2.8/29 - 7.7.2.15/29 (SwR10 – R8)
3. 7.7.2.16/29 - 7.7.2.23/29 (R6 – R3)
4. 7.7.2.24/29 - 7.7.2.31/29 (R7 – R1)
5. 7.7.2.32/29 - 7.7.2.39/29 (R1 – R2)

The private addresses of AS10 are in the block 10.2.80.2/22. /22 means 1024 addresses, which divided by 4 VLANs is 256. However, we will not be assigning private addresses to VLAN 1 as it is part of a different address block (public).

1. 10.2.80.0/24 - 10.2.80.255/24 (*Unused*)
2. 10.2.81.0/24 - 10.2.81.255/24 (VLAN 3)
3. 10.2.82.0/24 - 10.2.82.255/24 (VLAN 4)
4. 10.2.83.0/24 - 10.2.83.255/24 (VLAN 5)

The public addresses of AS10 are in the block 193.10.2.0/27.

1. 193.10.2.0/28 - 193.10.2.15/28 (SwR9)
2. 193.10.2.16/29 - 193.10.2.23/29 (SwR10)
3. 193.10.2.24/29 - 193.10.2.31/29 (VLAN 1)

The address block for AS20 is 193.20.2.0/25. /25 means 128 addresses, which divided by 4 subnets is 32.

1. 193.20.2.0/27 - 193.20.2.31/27
2. 193.20.2.32/27 - 193.20.2.63/27
3. 193.20.2.64/27 - 193.20.2.95/27
4. 193.20.2.96/27 - 193.20.2.127/27

The address block for AS30 is 193.30.2.0/25. /25 means 128 addresses, which divided by 2 VLANs is 64.

1. 193.20.2.0/26 - 193.20.2.63/26 (VLAN 2)

2. 193.20.2.64/26 - 193.20.2.127/26 (VLAN 3)

PHASE 1

For the first phase, we were required to configure the autonomous system 10 (AS10). We first configured a VLAN database composed of 4 VLANs on the switches and switch-routers with inter-VLAN routing on the switch-routers. However, we had to lookup how to add/remove allowed VLANs on the trunk connections between switches and switch-routers.

Next, we had to create a DHCP server in SwR10. The first issue that came up was the fact that we had to exclude the interface of each VLAN for each switch and switch-router, except for SwR10. Next, we created a DHCP pool for each VLAN network, associating each one to a default router (VLAN 3 and 4 for SwR9 and VLAN 5 for SwR10) and associating them to the DNS server which will be configured in a later phase. In order to automatically provide an IP address to each PC on AS10, we used the command “ip dhcp” on their respective terminals.

After that we had to set up a NAT box in SwR9 and SwR10. There are two main configurations to be made for this setup. The first one is we have to implement an access list, which are the private address that are going to be translated from inside the autonomous system. Next, we set up the outside NAT pool, containing the range of public addresses for translation.

After that we could ping between the PCs and devices within AS10 (with no name resolution just yet).

PHASE 2

This phase, we had to configure OSPFv2 with some nuances. It was very straight forward, but we had two very slight problems.

The first one is how to assign an unnumbered network to a serial point-to-point connection. The command we used was “ip unnumbered {interface}” where the interface field we type is the one that the interface of the link is going to borrow. In this case, the ones that were borrowed were the interfaces FastEthernet 0/0 for routers 6 and 5.

The second problem that we had to deal with was when we had to implement loopback interfaces to R5 and associate them to the OSPF protocol. The command to solve this was by entering configuration mode of the loopback (e.g. “int loopback 0”) and then doing the following command “ip ospf 1 area 0”.

PHASE 3

In this phase, we configured the Autonomous System 30 (AS 30). We started by configuring two VLANs, VLAN 2 and VLAN 3 in Sw4. Next, we looked up how to configure VLAN 2 to be the native VLAN, utilizing the command “switchport trunk native vlan 2” on both f1/0 and f1/1 interfaces of switch 4.

After that, we created a VLAN database on both R2 and R3 routers. In R2, we configured an interface for the two VLANs by using sub-interfaces.

We configured both f0/1.2 and f0/1.3 with the command “encapsulation dot1q {sub-interface number}”, which applies a specific VLAN ID to the sub-interface. When encapsulating VLAN 2 we also made sure to incorporate the keyword native in the command aforementioned (“encapsulation dot1q 2 native”).

The equivalent commands were done on R3, specifically on sub-interfaces f0/0.2 and f0/0.3.

Finally, we set up the default gateways of both spock.ar.pt and kirk.ar.pt, while also manually configuring the IP addresses assigned for them and making sure to give them the proper DNS IP address.

PHASE 4

On phase 4, the objective was to create the DNS server intended to be used across all devices but most importantly for the DHCP server of AS10 to function correctly.

The first thing we had to do is configure the server itself. So, after activating the server on R1 with "ip dns server" we have to enable its lookup feature using "ip domain-lookup" and configure the address 83.2.2.1 to the server ("ip name-server 83.2.2.1"). After that, we add the hosts with the command "ip host {domain}" where the domain field is, for example, spock.ar.pt.

As a side note, we used 83.2.2.1 instead of 83.2.1.1, because after doing the command "ip name-server 83.2.1.1" it threw a warning ("it's this router – configuring anyway…") and we thought that we had to create a new interface for it work. But after creating the new loopback interface we obviously still came across the same warning. However, we still used that address as it was more intuitive to use because it used the same logic for IP assignment as R5.

The following request was a HTTP server on R1. We implemented the AAA (Authentication, Authorization, Accounting) model using "aaa new-model". After that we configured the authentication and authorization to be local ("aaa authentication login default local" and "aaa authorization exec default local") along with a username and password. Then we configured the server itself, like the configuration guide provided by CISCO.

To use the R1 terminal you have type in the credentials: Username = you, Password = 123.

To test using telnet (for now you can only test on R7 and R2, the border routers of AS20 and AS30) use the command "telnet 7.7.2.26 8080" for R7 and "telnet 7.7.2.34 8080" for R2.

PHASE 5

In this phase reside most of the problems of our implementation. We have AS10 and AS20 connected through RIP, with redistribution of the RIP routes into OSPF and BGP for AS20 and vice-versa. However, there are some pings that are not functional and after testing them with Wireshark, we saw that some packets are being lost within SwR9. Also, when we try to ping SwR10 from a device in AS20, the route goes through the eBGP connection between R8 and SwR9 instead of SwR10.

We also have another problem in the eBGP between ASes 20, 30 and 40. Whenever we attempt to redistribute the routes on the border router R7 it shows that the routes for the loopback addresses of R1 (83.2.2.1 and 83.2.1.1) come from 7.7.2.26, interface f0/1 of R7. But, when we try to redistribute the routes in R6, the routes that R7 redistributed from R1 show a different source (coming from R5 – 193.20.2.33). This seems very strange as the shortest path to R1 is through R7.

BGP works in some cases. For example, you can do "ping kirk.ar.pt" on spock.ar.pt and vice-versa (DNS name resolution) and it works. However, you can only test HTTP on the border routers.